

REMARKS

By the present Amendment, claims 1 and 26 have been amended. No claims have been added or cancelled. Accordingly, claims 1-6 and 26-29 remain pending in the application. Claims 1 and 26 are independent.

In the Office Action of July 18, 2008, claims 1, 4, 5, 26, and 27 were rejected under 35 USC §103(a) as being unpatentable over Ko et al. ("Ko") in view of U.S. Patent No. 5,852,470 issued to Kondo et al. Claim 2 was rejected under 35 USC §103(a) as being unpatentable over Ko in view of Kondo, and further in view of Henry et al. ("Henry"). Claim 3 was rejected under 35 USC §103(a) as being unpatentable over Ko in view of Kondo, and further in view of U.S. Patent No. 6,801,650 issued to Kikuchi et al. ("Kikuchi"). Claims 6, 28, and 29 were rejected under 35 USC §103(a) as being unpatentable over Ko in view of Kondo, and further in view of Xu et al. ("Xu"). These rejections are respectfully traversed.

In rejecting the claims, the Office Action principally alleges that Ko discloses a method for classifying defects that includes most of the features recited in the claimed invention. Specifically, the Office Action indicates that Ko discloses obtaining an image of a defect on a sample, extracting a characteristic of the defect from the image, classifying the defect in accordance with the extracted characteristic, calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes, calculating a set of second likelihoods of the defect belonging to each of a plurality of defect classes, and calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification by the first and second likelihoods. Furthermore, the Office Action indicates that Ko discloses classifying the defects by using the third likelihoods.

The Office Action admits that Ko fails to disclose calculating a weighted average. Kondo is relied upon for disclosing calculation of a weighted average. The Office Action concludes that it would have been obvious to combine the teachings of Kondo with those of Ko in order to derive predicted values in order for a highly accurate classification. Applicants respectfully disagree.

By the present Amendment, Applicants have amended independent claim 1 to better define the claimed invention with respect to features that are not shown or disclosed by the art of record. As amended, independent claim 1 defines a method for classifying defects that comprises:

- obtaining an image of a defect on a sample;
- extracting a characteristic of the defect from the image; and
- classifying the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification,

wherein the step of classifying further comprises:

- calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes of the rule-based classification, by use of the extracted characteristic;
- calculating a set of second likelihoods of the defect belonging to each of a plurality of defect classes of the learning type classification, by use of the extracted characteristic;
- calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification, by use of the first and second likelihoods; and
- classifying the defect by use of the third likelihoods.

According to the method of independent claim 1, an image of a defect on a sample is first obtained, and a characteristic of the defect is extracted from the image. Next, the defect is classified in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification. The

classification step also includes several substeps. Specifically, a set of first likelihoods that the defect belongs to each of the plurality of defect classes of the rule-based classification is calculated using the extracted characteristic. Next, a set of second likelihoods is calculated that the defect belongs to each of a plurality of defect classes of the learning type classification using the extracted values. A set of third likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification is calculated using the first and second likelihoods. Finally, the defect is classified using the third likelihoods.

The Office Action alleges that Ko discloses various features of the claimed invention including calculation of a set of first likelihoods, a set of second likelihoods, and a set of third of third likelihoods, and directs reference to various passages where these features are purportedly disclosed. Applicants respectfully disagree with the Office Action's interpretation of some of these features. For example, the LVQ neural network of Ko is entirely different from the claimed step of calculating a set of first likelihoods. Ko clearly states that the LVQ neural network is a self organizing neural network, and is completely silent on performing any type of rule-based classification in which defects can be classified on the basis of predetermined classification references.

The adaptive learning mechanism of Ko also differs from the step of calculating a set of second likelihoods. Rather, Ko discloses that the adaptive learning mechanism is used to select an optimal number of clusters during a learning procedure. See lines 16-17. There is no disclosure or suggestion for calculating likelihoods for each classification of the rule-based classification, as set forth in the claimed invention.

Further, despite the assertions made in the Office Action, Ko is actually silent on calculating a set of third likelihoods. The cited passage merely indicates that a supervised learning method readjusts the boundaries of varies classes once the adaptive learning procedure is complete. There is no discussion of calculating the third set of likelihoods based on the first and second likelihoods. This is to be expected because Ko actually fails to provide any disclosure or suggestion for calculating the first and second likelihoods. Consequently, it is not possible for Ko to disclose calculation of the third set of likelihoods based on the first and second likelihoods.

The Office Action relies on Kondo for disclosing calculation of a weighted average. However, Applicants' review of Kondo has failed to reveal any disclosure or suggestion for the steps that are not disclosed by Ko. Accordingly, the combination of these references still fails to disclose or suggest all the features recited in independent claim 1, including the steps of:

- calculating a set of first likelihoods of the defect belonging to each of a plurality of defect classes of the rule-based classification, by use of the extracted characteristic;

- calculating a set of second likelihoods of the defect belonging to each of a plurality of defect classes of the learning type classification, by use of the extracted characteristic;

- calculating a third set of likelihoods of the defect belonging to each of the defect classes of the learning type classification and/or the defect classes of the rule-based classification, by use of the first and second likelihoods; and

- classifying the defect by use of the third likelihoods.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2-6 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent

claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 26 defines an apparatus for classifying defects that comprises:

- an imager which obtains an image of a defect on a sample;
 - a characteristic extractor which extracts a characteristic of the defect from the image;
 - a classifier which classifies the defect in accordance with the extracted characteristic, and based on a rule-based classification and a learning type classification, and
 - a display for displaying the image of the defect and the classification result on a screen;
- wherein said classifying means comprises:
- a rule-based classifier which calculates a set of first likelihoods of the defect belonging to each of plurality of rule classes by use of the characteristics of the defect,
 - a learning type classifier which calculates a set of second likelihoods of the defect belonging to each of a plurality of defect classes by use of the characteristic of the defect; and
 - a calculator which calculates a set of third likelihoods of the defect belonging to each of said defect classes and/or rule classes, by use of the first and second likelihoods, and
 - a classifier which classifies the defects by use of the calculated third likelihoods.

Independent claim 26 recites various features that are somewhat similar to those recited in independent claim 1. For example, a rule-based classifier calculates a set of first likelihoods that the defect belongs to each of a plurality of rule classes. A learning type classifier calculates a set of second likelihoods that the defect belongs to each of the plurality of defect classes. Additionally, a calculator calculates a set of third likelihoods that the defect belongs to each of the defect classes and/or rule classes using the first and second likelihoods. A classifier is also used to classify the defects using the calculated third likelihood. As previously

discussed with respect to independent claim 1, Ko does not appear to provide any disclosure or suggestion for such features.

It is therefore respectfully submitted that independent claim 26 is allowable over the art of record.

Claims 27-29 depend from independent claim 26, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 26. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.


For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.

If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 500.43701X00).

Respectfully submitted,
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Dated: November 18, 2008